LAZARIDIS
School of Business & Economics

Hedging Strategies

WILFRID LAURIER UNIVERSITY

DIEGO AMAYA

Starting Hedging

Bloomberg: *Airlines and Shippers Pounce on Oil Plunge to Lock in Prices* (Apr 9, 2025)

- When oil prices fell sharply (below ~$60/barrel in that moment), fuel-heavy companies like **airlines, truckers, and shipping firms** moved quickly to **lock in lower costs** using derivatives.
- Their biggest goal is **cost certainty** (fuel can be a top operating cost).
- A sudden drop in oil prices is basically a “sale,” so locking in via hedges protects them if prices rebound later.

Chocolate makers slash price hedges in bet that bull market is over

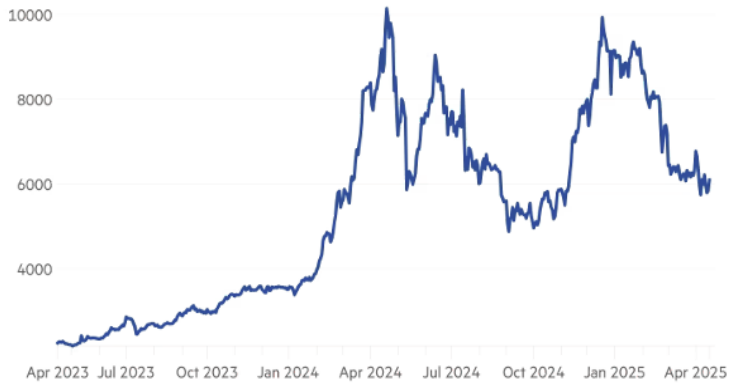
Soaring cost of protection using futures contracts prompts some groups to gamble on market stabilising

Buyer hedging on cocoa markets has fallen to a 20-year low

ICE Commitments of Traders (COT) futures commercial long cocoa

Cocoa prices have swung wildly over the past year

ICE London cocoa futures (£ per metric tonne)



Source: LSEG via markets.ft.com

Hedging Unwinding

Chocolate makers **reduced ("slashed") their hedging** against cocoa price increases because **the cost of hedging itself surged** as cocoa futures markets became extremely volatile.

Why they pulled back?

- **Futures got "too expensive" to use** as protection (hedging costs jumped).
- In fast-moving cocoa markets, companies may face **large margin calls** (cash posted to maintain futures positions), which can strain liquidity—especially when prices spike.
- Some firms were effectively making a judgment that the **bull market might be near its end**, so paying huge hedge costs looked unattractive.

Hedging

Most futures are traded to preexisting hedge risks in some line of business.

A man sells umbrellas and sunglasses in a tourist spot

- By choosing his wares wisely, he has built a natural hedge. Come rain or come shine, he has something to sell.
- Natural hedges are hard to find.
- In such cases, businesses often use derivatives for risk management.

Who hedges?

- A majority of the Fortune 500 companies and a growing number of smaller firms hedge risk.
- Farmers often hedge the selling price of their produce.
- Many producers hedge input as well as output price risk.
- Portfolio managers

The Benefits of Corporate Hedging

1. Hedging locks in a future price.

Example The Chicago Board of Trade was created to build an orderly market for grain trading.

- Farmers could lock in stable prices and plan production and marketing activities accordingly.

2. Hedging permits forward pricing of products.

Example Many airlines hedge aviation fuel prices.

- If fuel and other costs are fixed, the airline can set a profit margin and sell tickets well in advance of the time of travel.

Hedging with Futures

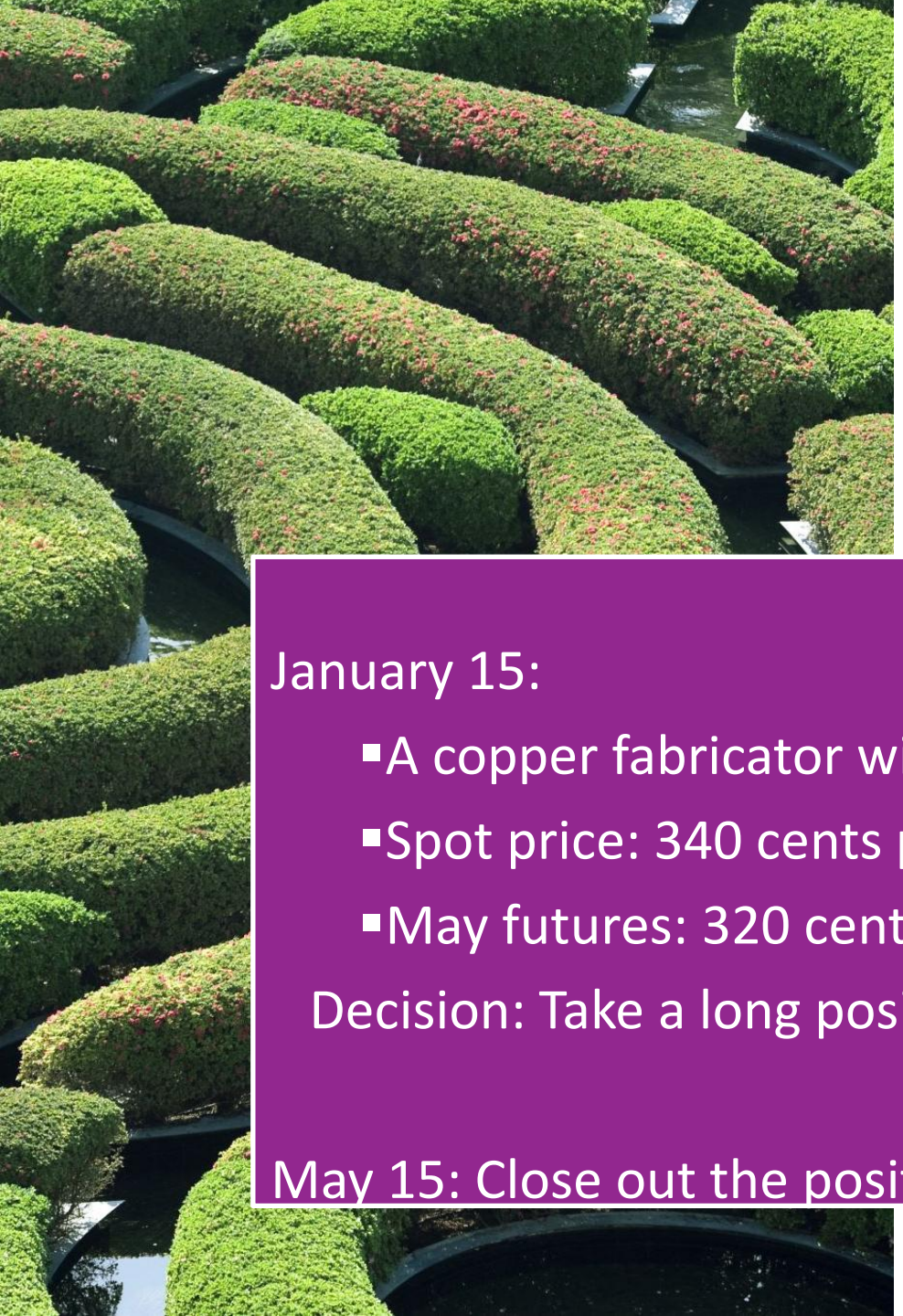
A perfect hedge completely eliminates spot-price risk for a commodity. This happens when

- the futures contract is written on the commodity being hedged
- the contract matures when the hedger is planning to lift the hedge
- the size and other characteristics of the futures contract unerringly fit the hedger's need

Imperfect or cross-hedges occur when at least one of these three conditions is not satisfied.

Example

- A bank may reduce the price risk of its loan portfolio by trading Treasury bond futures contracts.



Long Hedges

A long futures hedge is appropriate when you know you will purchase an asset in the future and want to lock in the price

Example

January 15:

- A copper fabricator will require 100,000 pounds of copper on May 15
- Spot price: 340 cents per pound
- May futures: 320 cents per pound

Decision: Take a long position in four May futures contracts on copper

May 15: Close out the position

Short Hedges

A short futures hedge is appropriate when you know you will sell an asset in the future and want to lock in the price

Example

May 15:

- An oil producer has negotiated a contract to sell 1M barrels of crude oil on August 15.
- Selling price is the realized spot price in August 15.
- Spot price: $60 per barrel
- August futures: $59 per barrel

Decision: Take a short position in 1,000 August futures contracts on crude oil

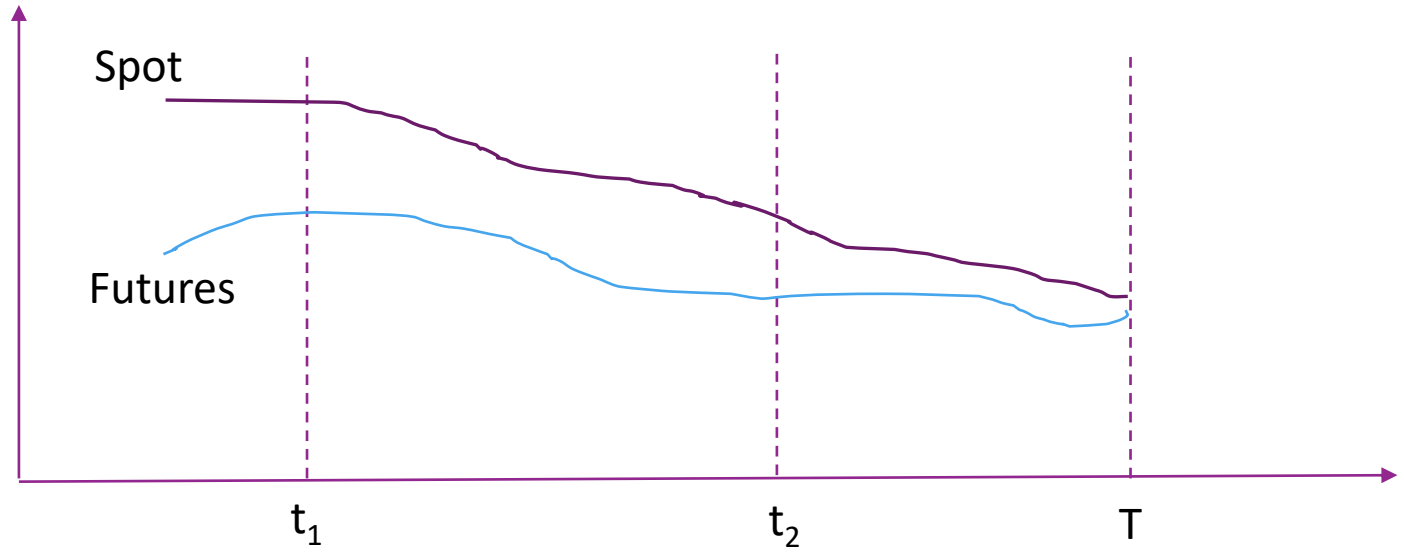
August 15: Close out the position

Basis Risk

Basis is the difference between spot & futures:

Basis = Spot price of asset to be hedged – Futures price of contract used

Basis risk arises because of the uncertainty about the basis when the hedge is closed out



Long Hedge for Purchase of an Asset – Basis risk

Define

- F_1 : Futures price at time hedge is set up
- F_2 : Futures price at time asset is purchased
- S_2 : Asset price at time of purchase
- b_2 : Basis at time of purchase

Cost of asset	**S_2**
Gain(loss) on Futures	$F_2 - F_1$
Net amount paid	$S_2 - (F_2 - F_1) = F_1 + \mathbf{b_2}$

Example

$S_1 = 2.50$
$F_1 = 2.20$

$S_2 = 2.00$
$F_2 = 1.90$

t_1 t_2

$b_1 = 2.50 - 2.20 = 0.3$

$b_2 = 2.00 - 1.90 = 0.1$

Net amount paid: $S_2 - (F_2 - F_1) = 2.30$
$F_1 + b_2 = 2.30$

Price of asset	**S_2**
Gain(loss) on Futures	$F_1 - F_2$
Net amount received	$S_2 + (F_1 - F_2) = F_1 + \mathbf{b_2}$

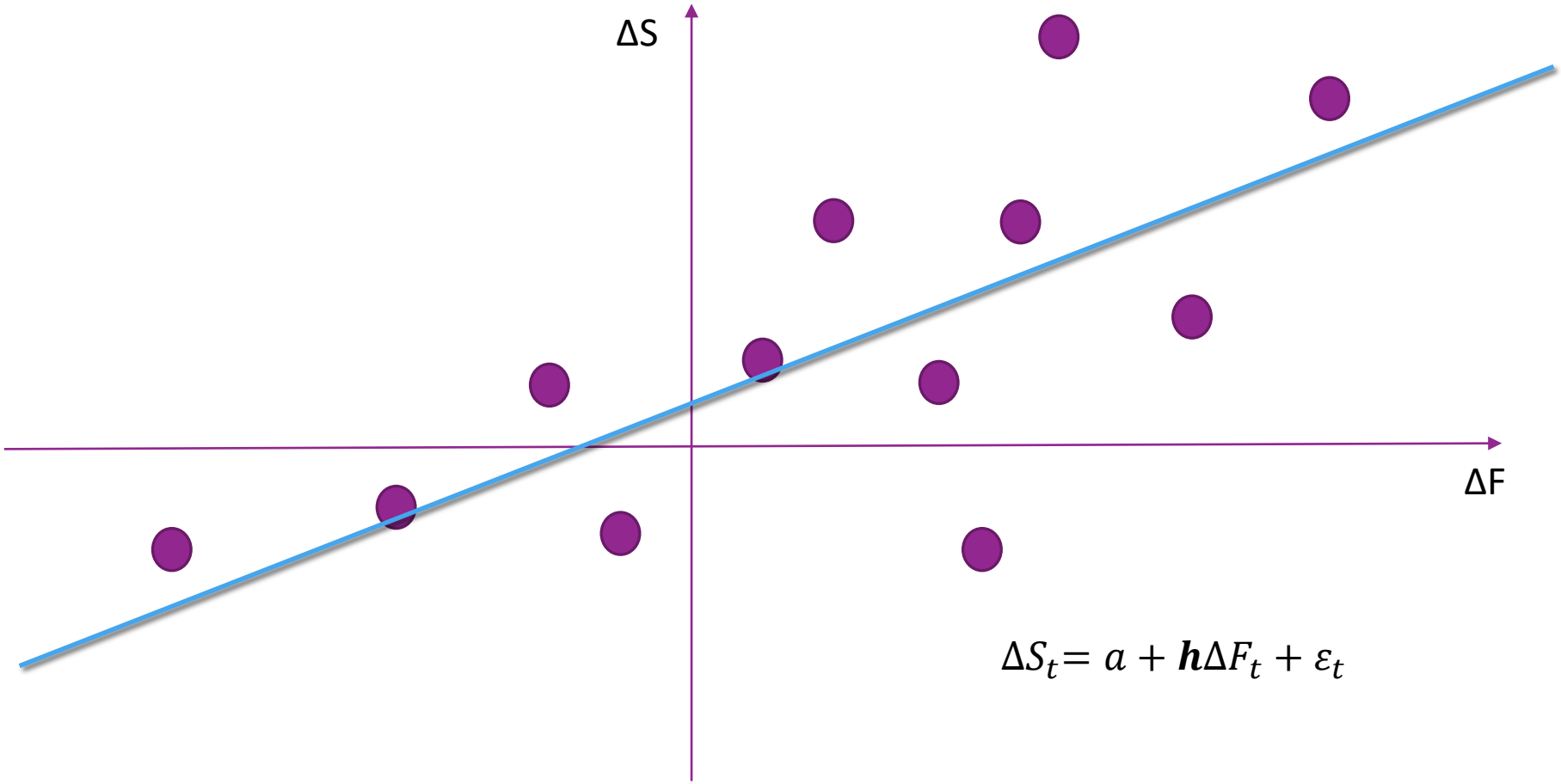
Short Hedge for Sale of an Asset – Basis Risk

Choice of Contract

- Choose a delivery month that is as close as possible to, but later than, the end of the life of the hedge
- When there is no futures contract on the asset being hedged, choose the contract whose futures price is most highly correlated with the asset price. There are then 2 components to basis

$$S_2 + F_1 - F_2 = F_1 + \underbrace{(S_2^* - F_2)}_{\text{Basis from futures}} + \underbrace{(S_2 - S_2^*)}_{\text{Basis from difference between assets}}$$

Cross Hedging – Minimum Variance Hedge Ratio



$$\Delta S_t = a + \boldsymbol{h}\Delta F_t + \varepsilon_t$$

Optimal Hedge Ratio

Proportion of the exposure that should optimally be hedged is

$$h^* = \rho \frac{\sigma_S}{\sigma_F}$$

where

σ_S is the standard deviation of ΔS, the change in the spot price during the hedging period,

σ_F is the standard deviation of ΔF, the change in the futures price during the hedging period

ρ is the coefficient of correlation between ΔS and ΔF.

Alternative Definition of Optimal Hedge Ratio

Optimal hedge ratio is

$$\hat{h} = \hat{\rho}\frac{\hat{\sigma}_S}{\hat{\sigma}_F}$$

where variables are defined as follows

$\hat{\rho}$	Correlation between daily changes for spot and futures
$\hat{\sigma}_S$	SD of daily changes in spot
$\hat{\sigma}_F$	SD of daily changes in futures

Example – Optimal Hedge Ratio

Airline will purchase 2 million gallons of jet fuel in one month and hedges using heating oil futures

From historical data σ_F =0.0313, σ_S =0.0263, and ρ= 0.928

$$h^* = 0.928 \times \frac{0.0263}{0.0313} = 0.78$$

Optimal Number of Contracts

Q_A Size of position being hedged (units)

Q_F Size of one futures contract (units)

V_A Value of position being hedged (=spot price times Q_A)

V_F Value of one futures contract (=futures price times Q_F)

Optimal number of contracts if no adjustment for daily settlement

$$= \frac{h^* Q_A}{Q_F}$$

Optimal number of contracts after "tailing adjustment" to allow or daily settlement of futures

$$= \frac{\hat{h} V_A}{V_F}$$

Example – Optimal Number of Contracts

Suppose that each heating oil contract traded on NYMEX is on 42,000 gallons of heating oil. If the optimal hedging ratio for the Airline is 0.78 and the total amount of the exposure 2M gallons, then:

Optimal number of contracts is : $0.78 \times 2{,}000{,}000/42{,}000$

which rounds to 37

Example – Optimal Number of Contracts with tailing

Suppose that the spot price and the futures price are 1.94 and 1.99 dollars per gallon, respectively.

VA = 2,000,000 x 1.94 = 3,880,000

VF = 42,000 x 1.99 = 83,580

Optimal number of contracts : 0.78 x 3,880,000 /83,580 = 36

Hedging Using Index Futures

To hedge the risk in a portfolio, the number of contracts that should be shorted is

$$\beta \frac{V_A}{V_F}$$

where V_A is the current value of the portfolio, β is its beta, and V_F is the current value of one futures (=futures price times contract size)

Exercise

- Futures price of S&P 500 is 2,200
- S&P 500 Index is 2,280
- Size of portfolio is $5 million
- Beta of portfolio is 1.5
- One contract is on $250 times the index

What position in futures contracts on the S&P 500 is necessary to hedge the portfolio?

Changing Beta of a Portfolio

- To change beta from β to β^* where $\beta > \beta^*$:

$$\text{Short position of: } (\beta - \beta^*)\frac{V_A}{V_F}$$

- To change beta from β to β^* where $\beta < \beta^*$ long:

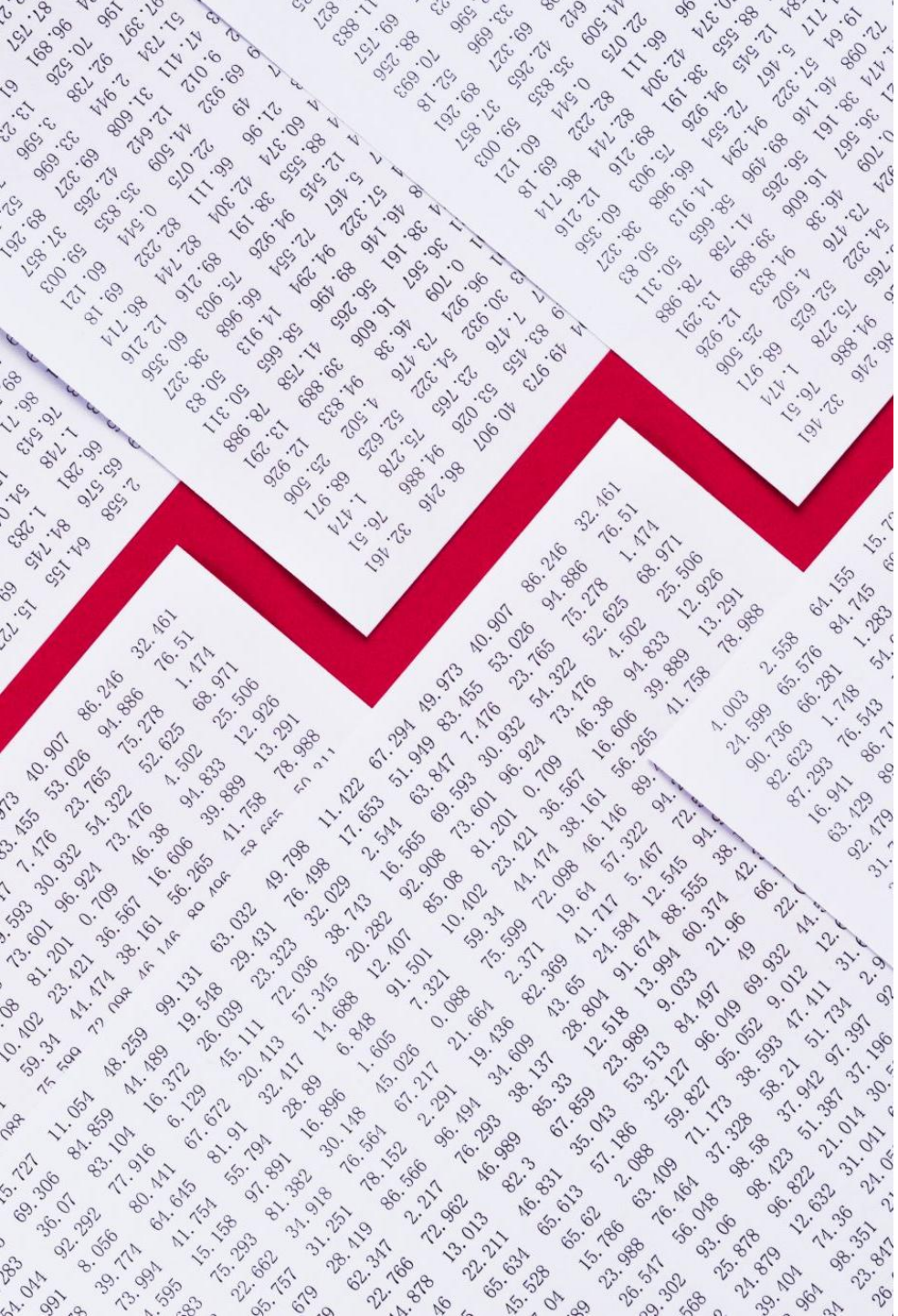
$$\text{Long position of: } (\beta^* - \beta)\frac{V_A}{V_F}$$

Exercise: Changing Beta

- Futures price of S&P 500 is 2,200
- S&P 500 Index is 2,280
- Size of portfolio is $5 million
- Beta of portfolio is 1.5
- One contract is on $250 times the index

What position is necessary to reduce the beta of the portfolio to 0.75?

What position is necessary to increase the beta of the portfolio to 2.0?



Why Hedge Equity Returns?

- Many want to be out of the market for a while. Hedging avoids the costs of selling and repurchasing the portfolio
- Suppose stocks in your portfolio have an average beta of 1.0, but you feel they have been chosen well and will outperform the market in both good and bad times. Hedging ensures that the return you earn is the risk-free return plus the excess return of your portfolio over the market.

Stack and Roll

- We can roll futures contracts forward to hedge future exposures
- Initially we enter into futures contracts to hedge exposures up to a time horizon
- Just before maturity we close them out an replace them with new contract reflect the new exposure
- Etc.